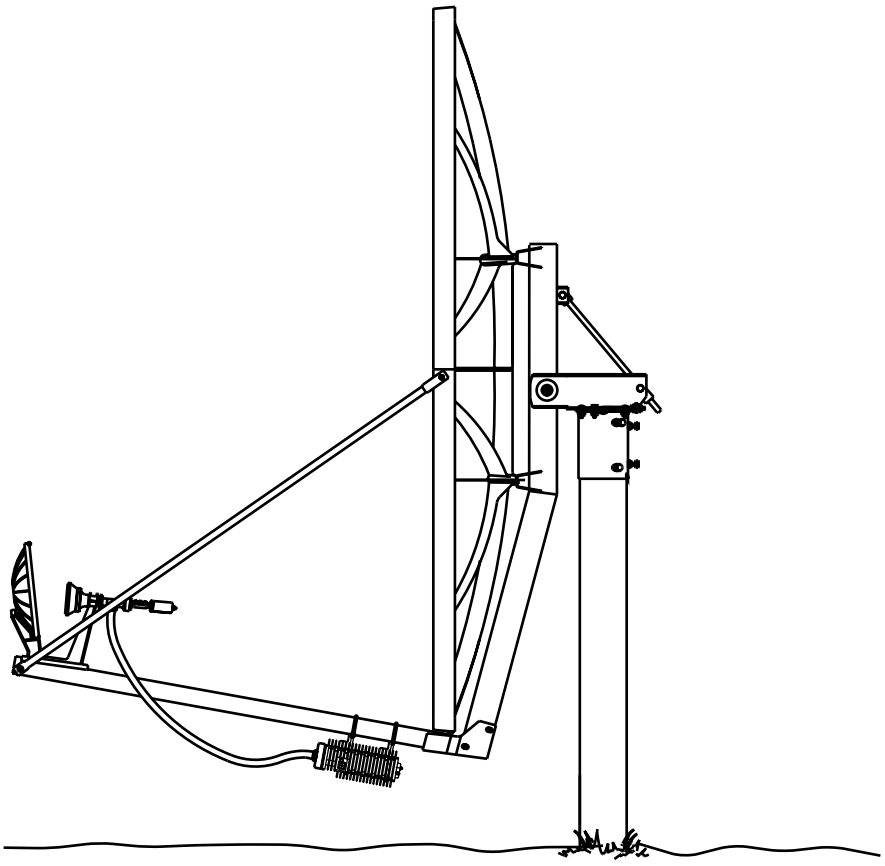
INSTRUCTION AND ASSEMBLY MANUAL



TYPE 244
2.4m Offset Tx/Rx Antenna System

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Printed in U.S.A.
8000722-02
ECN 9000000
2/03

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VSAT ANTENNA/MOUNT/LNB
LIMITED TWELVE (12) MONTH WARRANTY

This CHANNEL MASTER® equipment is warranted to be free from defects in material and workmanship under normal use and service. CHANNEL MASTER shall repair or replace defective equipment, at no charge, or at its option, refund the purchase price, if the equipment is returned to CHANNEL MASTER not more than twelve (12) months after shipment. Removal or reinstallation of equipment and its transportation shall not be at the cost of CHANNEL MASTER except CHANNEL MASTER shall return repaired or replaced equipment freight prepaid.

This Warranty shall not apply to equipment which has been repaired or altered in any way so as to affect its stability or durability, or which has been subject to misuse, negligence or accident. This Warranty does not cover equipment which has been impaired by severe weather conditions such as excessive wind, ice, storms, lightning, or other natural occurrences over which CHANNEL MASTER has no control, and this Warranty shall not apply to equipment which has been operated or installed other than in accordance with the instructions furnished by CHANNEL MASTER.

Claimants under this Warranty shall present their claims along with the defective equipment to CHANNEL MASTER immediately upon failure. Non-compliance with any part of this claim procedure may invalidate this warranty in whole or in part.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER AGREEMENTS AND WARRANTIES, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IS LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY. CHANNEL MASTER DOES NOT AUTHORIZE ANY PERSON TO ASSUME FOR IT THE OBLIGATIONS CONTAINED IN THIS WARRANTY AND CHANNEL MASTER NEITHER ASSUMES NOR AUTHORIZES ANY REPRESENTATIVE OR OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE EQUIPMENT DELIVERED OR PROVIDED.

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In no event shall CHANNEL MASTER be liable for damages in an amount greater than the purchase price of the equipment.

Some states do not allow limitations on how long an implied warranty lasts, or allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

DATE	DESCRIPTION	REV.
2/03	ECN 9000000	Rel.

IMPORTANT!!!

INSTALLATION OF THIS PRODUCT SHOULD BE PERFORMED ONLY BY A PROFESSIONAL INSTALLER AND IS NOT RECOMMENDED FOR CONSUMER D.I.Y. (DO-IT-YOURSELF) INSTALLATIONS.

DANGER!!!

WATCH FOR WIRES! Installation of this product near power lines is dangerous. For your own safety, follow these important safety rules.

1. Perform as many functions as possible on the ground.
2. Watch out for overhead power lines. Check the distance to the power lines before starting installation. We recommend you stay a minimum of 6 meters (20 feet) from all power lines.
3. Do not use metal ladders.
4. Do not install antenna or mast assembly on a windy day.
5. If you start to drop antenna or mast assembly, get away from it and let it fall.
6. If any part of the antenna or mast assembly comes in contact with a power line, call your local power company. DO NOT TRY TO REMOVE IT YOURSELF! They will remove it safely.
7. Make sure that the mast assembly is properly grounded.

WARNING!!!

Assembling dish antennas on windy days can be dangerous. Because of the antenna surface, even slight winds create strong forces. For example, a 1.0m antenna facing a wind of 32 km/h (20 mph) can undergo forces of 269 N (60 lbs). Be prepared to safely handle these forces at unexpected moments. Do not attempt to assemble, move or mount a dish on windy days or serious, even fatal accidents may occur. Channel Master® is not responsible or liable for damage or injury resulting from antenna installations.

WARNING!!!

Antennas improperly installed or installed to an inadequate structure are very susceptible to wind damage. This damage can be very serious or even life threatening. The owner and installer assumes full responsibility that the installation is structurally sound to support all loads (weight, wind & ice) and properly sealed against leaks. Channel Master will not accept liability for any damage caused by a satellite system due to the many unknown variable applications.

Assembly Tools Required

1 - Compass
1 - Clinometer
1 - 228mm or 9” Magnetic Bubble Level
1 - Torque Wrench (Capacity 4 Ft-lbs - 175 Ft-lbs)
(Capacity 5N-m- 237N-m)
1 - 24mm or 15⁄16” Deep Socket (½” or 13mm Drive)
1 - 19mm or ¾” Deep Socket (½” or 13mm Drive)
1 - Ratchet Wrench (½” or 13mm Drive)
1 - 10mm Nut Driver
1 - 10mm Box/Open End Wrench
1 - 12” Crescent Wrench (Adjustable)
1 - 10mm Socket (For Torque Wrench)
1 - 32mm or 1¼” Deep Socket (½” or 13mm Drive)

PREINSTALLATION MATERIALS CHECKLIST

Grounding Rod Clamp & Grounding Block - As Required by National Electric Code or local codes.

Ground Wire - As Required by National Electric Code or local codes (length required).

Coaxial Cable - Size and length required.

Concrete: See “Ground Pole” section for quantity.

M10 or #3 Rebar: See “Ground Pole” section for quantity. Deformed steel per ASTM A615, Grade 40 or 60.

SITE SELECTION

The first and most important consideration when choosing a prospective antenna site is whether or not the area can provide an acceptable “look angle” at the satellites. A site with a clear, unobstructed view is preferred. Also consider obstruction that may occur in the future such as the growth of trees. Your antenna site must be selected in advance so that you will be able to receive the strongest signal available. To avoid obstructions, etc., conduct an on-site survey with a portable antenna.

As with any other type of construction, a local building permit may be required before installing an antenna. It is the property owner’s responsibility to obtain any and all permits.

Before any digging is done, information regarding the possibility of underground telephone lines, power lines, storm drains, etc., in the excavation area should be obtained from the appropriate agency.

Because soils vary widely in composition and load capacity, consult a local professional engineer to determine the appropriate foundation design and installation procedure. A suggested foundation design with conditions noted is included in this manual for reference purposes only (see page 3). To assist in the foundation design, refer to “Antenna Windloads” in the Appendix “B” on page 16.

BOLT TORQUE

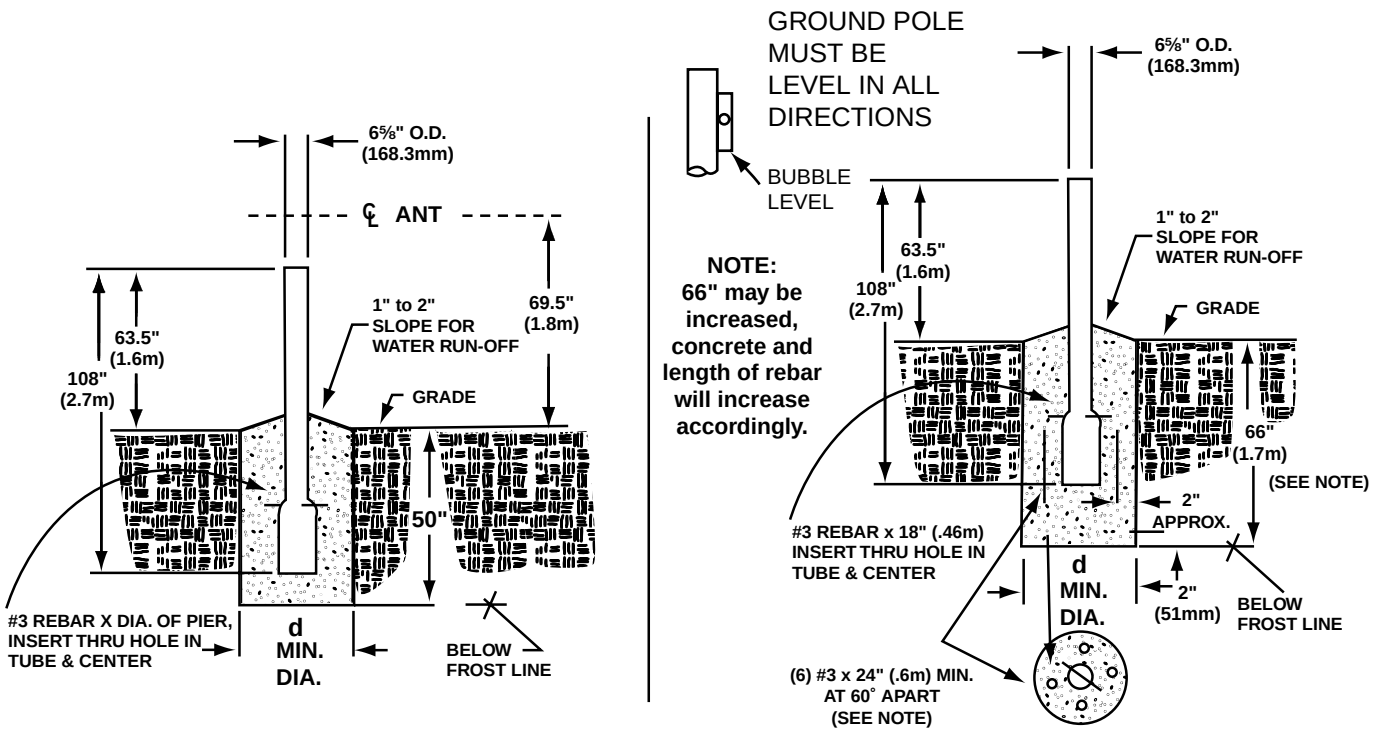
DIN CLASS 5.6						DIN CLASS 8.8		
M6	M8	M12	M16	M20	M22	M8	M12	M16
5 N-m	15 N-m	51 N-m	125 N-m	168 N-m	230 N-m	24 N-m	90 N-m	203 N-m
4 Ft-Lbs	11 Ft-Lbs	38 Ft-Lbs	92 Ft-Lbs	124 Ft-Lbs	170 Ft-Lbs	18 Ft-Lbs	66 Ft-Lbs	150 Ft-Lbs

Head marking 5.6 or 8.8, if no head marking use DIN Class 5.6 values in above chart.

EXCEPTIONS TO ABOVE CHART:

- M16 x 140mm Round Head Square Neck Bolts securing Antenna to Mount. Torque to 47 N-m (35 ft-lbs.)
- M12 x 40mm Hex Head Bolts securing Antenna Halves. Torque to 47 N-m (35 ft-lbs.)

GROUND POLE INSTALLATION - 4.50” O.D.



PIER FOUNDATIONS

DEEP FROST LINE FOUNDATIONS

WIND VEL.	DIM “d” Inches (Meter)	CONC VOL. CUYD (Cu Meter)	DIM “d” Inches (Meter)	CONC VOL. CUYD (CU Meter)	GROUND POLE
100 MPH	44” (1.12m)	1.7 (1.3)	37” (.94m)	1.6 (1.2)	“A”
125 MPH	53” (1.35m)	2.4 (1.8)	42.25” (1.15m)	2.6 (2.0)	“B”

POLE SPECIFICATIONS:

Ground Pole “A” - 6.62 O.D. SCH 40 (6.06 I.D.) Steel - (Metric = 168.3mm x 153.9mm I.D.)
Ground Pole “B” - 6.62 O.D. SCH 80 (5.76 I.D.) Steel - (Metric = 168.3mm x 146.3mm I.D.)

NOTE:

1. Poles are not supplied (purchased locally to ASTM A501) and must be field drilled ⅝ Dia. for M10 #3 rebar, drilled .218 (5.55mm) for ¼-20 self tapping grounding screw and galvanized or painted for protection.
2. Pole and foundation design based on the following criteria:
   a. Uniform building code Exposure C and 1.5 stability factory.
   b. Vertical soil pressure of 2000 pounds per square foot. (9765 Kilograms/meter square)
   c. Lateral soil pressure of 300 pounds per square foot. (1465 Kilograms/meter square)
   d. Concrete compressive strength of 2500 pounds per square inch (176 Kg/Cm^2) in 28 days.

CAUTION: The foundation design shown does not represent an appropriate design for any specific locality, since soil conditions vary and may not meet design criteria given in Note 2. You should consult a local professional engineer to determine your soil conditions and appropriate foundation.

ASSEMBLY AND INSTALLATION

Place reflector halves on a flat surface, face down. (Ref. Figure 1.0). Install M12 x 40mm hex bolts with flat washer into the two outer bolt holes at reflector rim. Secure with M12 flat washer, lock washer and hex nut as shown in Figure 1.1. Repeat on opposite side of reflector. Leave loose.

Install remaining seam bolts, working toward center of reflector as noted above. Repeat on opposite side of reflector. Leave finger tight. (Ref. Figure 1.1). NOTE: All seam bolts to be finger tight only.

Cross Arms to Backframe Tube (Figure 1.2)

Assemble cross arms (1a) to main tube (1) with M16 x 130mm hex bolt (47), lock washer (41) and hex nut (42) - 4 places as shown in Figure 1.2. **IMPORTANT: Hex nuts must be only finger tight for now - 4 places. (Torque will be applied in Page 5 after (4) reflector bolts are torqued.)**

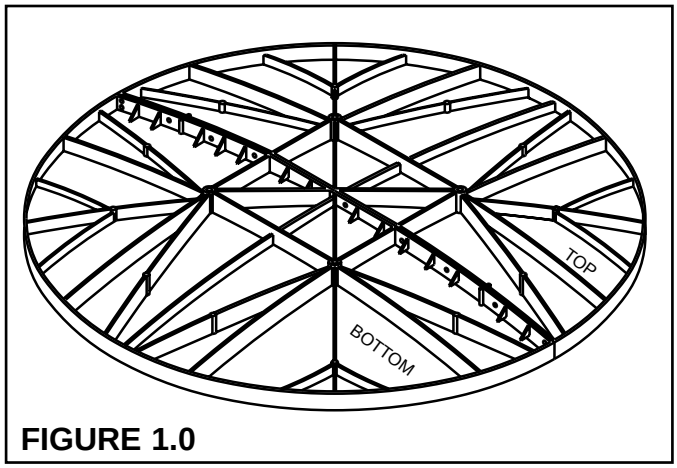


FIGURE 1.0

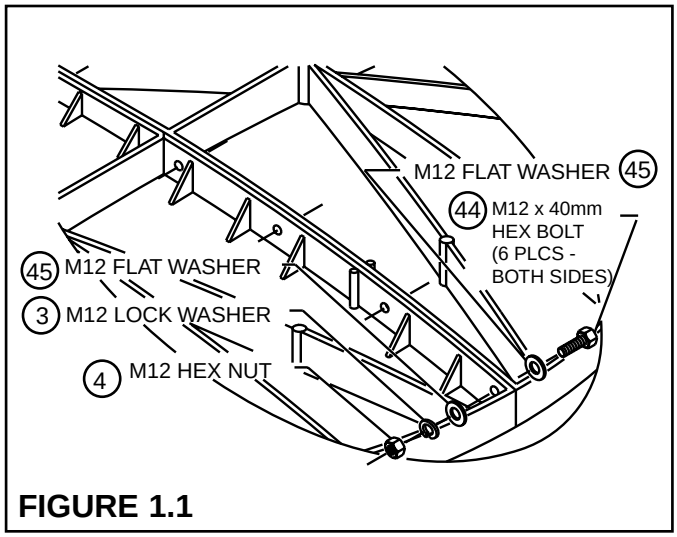


FIGURE 1.1

Yoke Cap Assembly (Figure 1.3)

Push M16 x 35mm round head square neck pivot bolt through center square hole in cap top plate (30) and attach left hand channel with azimuth screw and pivot plate (31). Secure with M16 hex nut and lock washer, torque to 8-11 ft-lbs (11-15 N-m).

Install two M12 x 35mm round head square neck bolts, flat washers, lock washers and hex nuts in channel (31) bottom flange and cap top plate (30). Connect flat end of azimuth screw to cap top plate (30) with M12 x 30mm hex head bolt, lock washer and hex nut.

Attach right hand channel (32) to cap top plate (30) with two M12 x 35mm round head square neck bolts, flat washers, and hex nuts. Pretorque all M12 x 35mm round head square neck bolts to 8-11 ft-lbs (11-15 N-m).

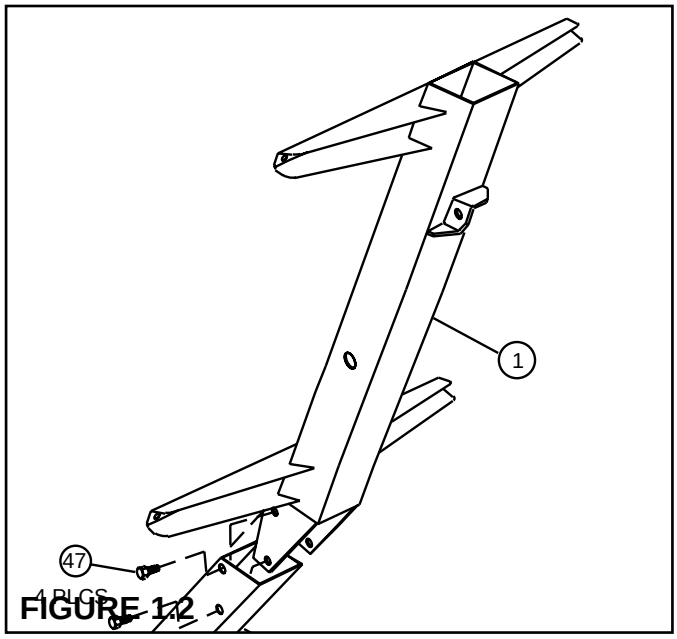


FIGURE 1.2

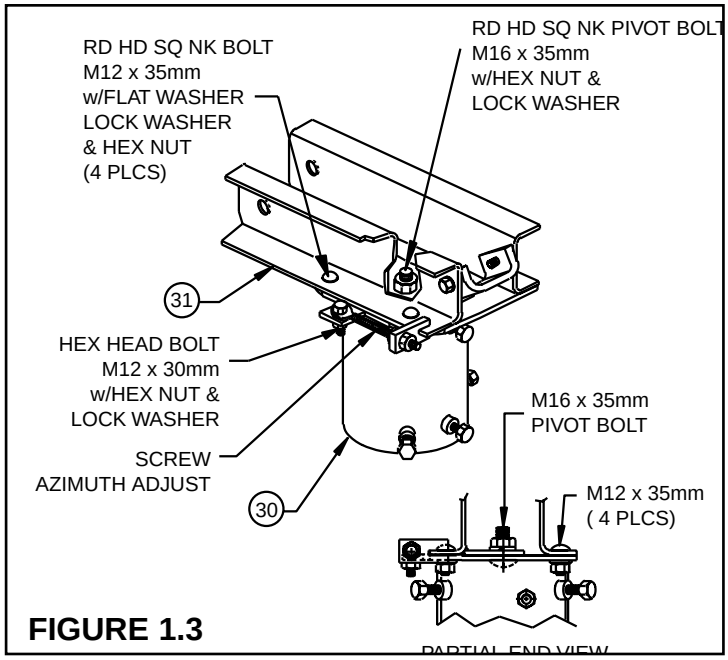


FIGURE 1.3

Yoke Cap and Backframe Assembly

Place yoke cap assembly onto ground pole. Reference Figure 1.4.

Install backframe (1) onto yoke cap assembly and secure with M22 x 150mm hex bolt, lock washer and hex nut (24, 15 & 14). Do not tighten. Remove two M12 bolts from trunnion, swing backframe down and secure elevation screw and trunnion (25 & 26) to AZ/EL cap with M12 x 30mm hex bolt and lock washer (17 & 3). Leave loose. Reference Figure 1.4 & 1.5.

Loosen M22 elevation nuts (14) on elevation screw (25) and run up to place backframe in birdbath position (see Figures 1.4 & 1.5).

Antenna Installation

Insert four M16 x 140mm round head square neck bolts (2) into reflector assembly (5) and affix on to backframe. Reflector section marked “TOP” must be located at the top end of backframe. Make sure round head square neck bolts are seated correctly before securing reflector to backframe. Secure reflector to backframe with M16 lock washers and hex nuts. **Leave these bolts loose.** Reference Figure 1.6.

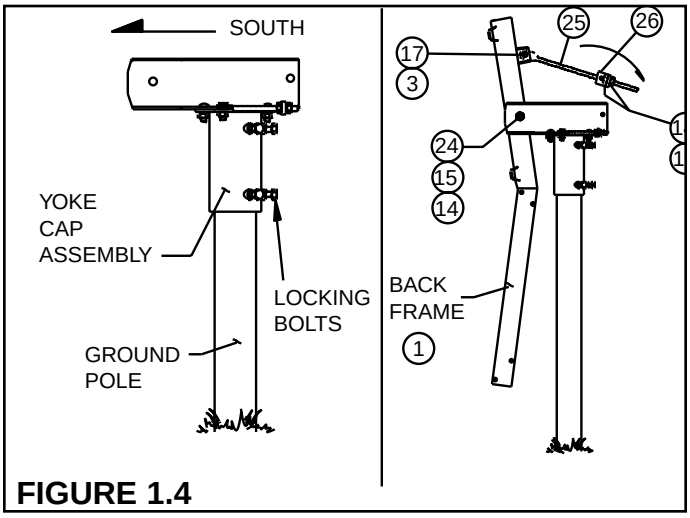


FIGURE 1.4

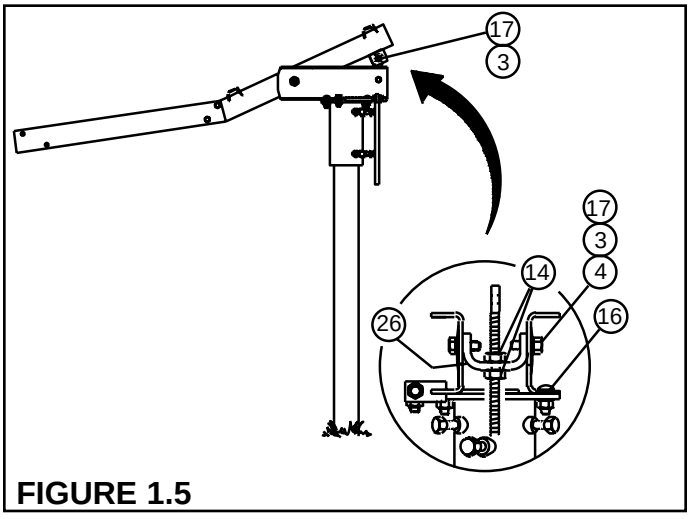


FIGURE 1.5

Seam Alignment

Lower reflector to vertical position by running down two elevation nuts (14).

Check the horizontal seam match as shown in Figure 1.7. If alignment is required, begin at the outer rim by pushing or pulling on the bottom reflector rim, while another tightens their seam bolts at this location. Continue this process, working toward the center, and alternating from one side to the other.

After all seam bolts are tightened, torque bolts, using the same sequences as above, to 35 ft-lbs (47 N-m). Now tighten and torque four reflector mounting bolts (2) to 35 ft-lbs (47 N-m). Torque cross arm (1a) bolts (47) per chart, Page 2, three places and lower bolt (47) one place to 60 ft-lbs (81 N-m).

NOTE: Certain models require additional alignment instructions. Refer to supplement for detailed instructions.

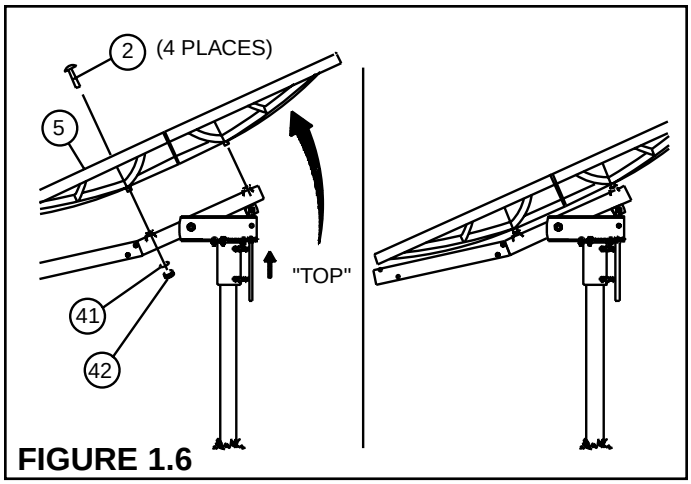


FIGURE 1.6

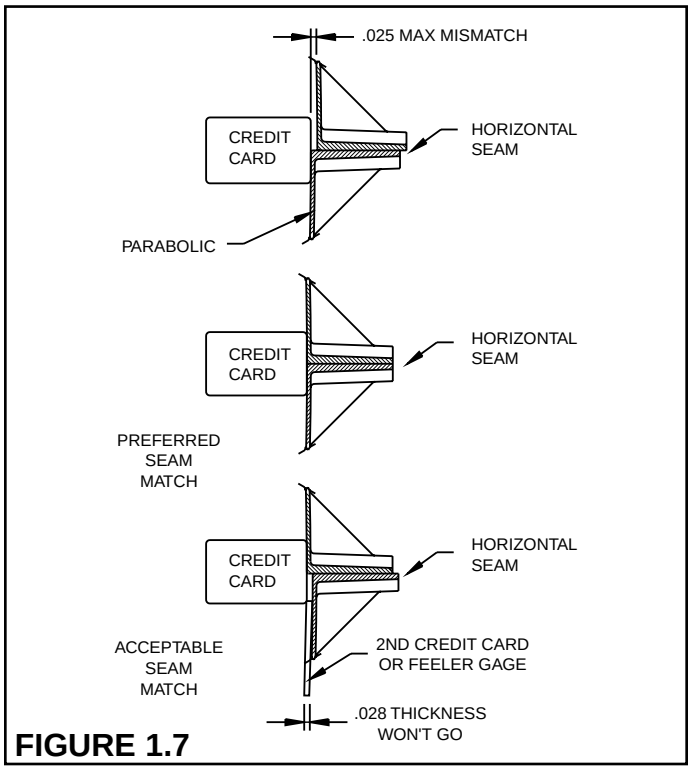


FIGURE 1.7

NOTE: ½" external tooth washers (11) must be assembled on bolts, with one under head of bolts and one under hex nuts (4), refer to Figure 1.8. <u>Leave these bolts loose.</u>

12 - Install left and right side struts onto reflector as shown in Figure 1.9A.

Attach long formed end of side struts (27) to reflector rim by inserting ¼" x ¾" hex head bolt (28) through inside of reflector rim and secure snug, but free to pivot with ¼" lock washer and hex nut (6 & 8).

Attach short formed end of side struts (27) to feed support tube with ¼" x 2" hex bolt, lock washer and hex nut (28, 8 & 6). Tighten and torque hardware securing side struts to feed support tube only to 6 Ft-lbs (8 N-m).

13 - Without using excessive pressure, lift feed support tube vertically just enough to relieve load off side struts and bottom rim gage bolt (Item 46). While another person tightens and torques ½" hex head bolts (*) securing feed support tube to backframe to 35 Ft-lbs (47 N-m). Tighten and torque ¼" hex head bolts (**) securing side struts to reflector to 4 Ft-lbs (5.4 N-m). Reference Figure 1.9B.

14 - Secure sub-reflector (30 to mount (47) with ¼" x ½ hex head screws and attach mount base with shim (55) to feed support tube with ¼ x 3½ hex head bolts, ¼ lock washers and ¼ hex nuts (48, 8 and 56). Refer to Figure 1.10.

Install feed horn/omt/filter assembly (52) onto mount with clamp (53) and secure with ¼ x1 hex head bolts and ¼ lock washers (54 & 8).

15 - Install ODU. Follow instructions provided with ODU.

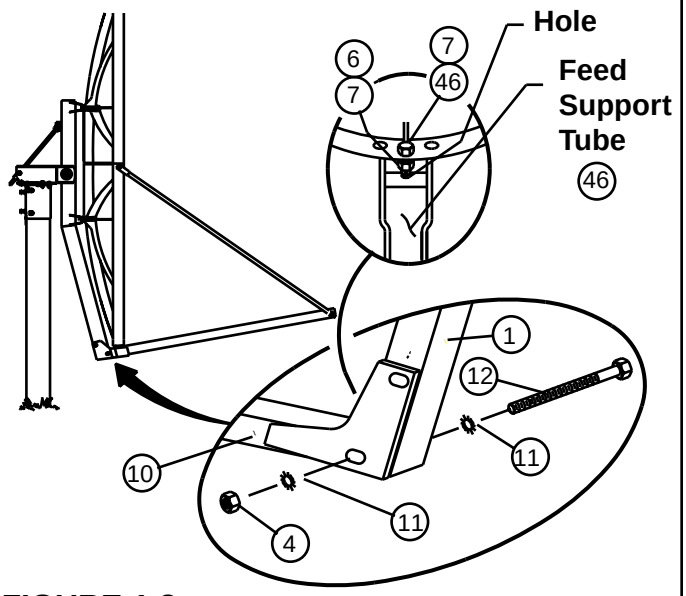


FIGURE 1.8

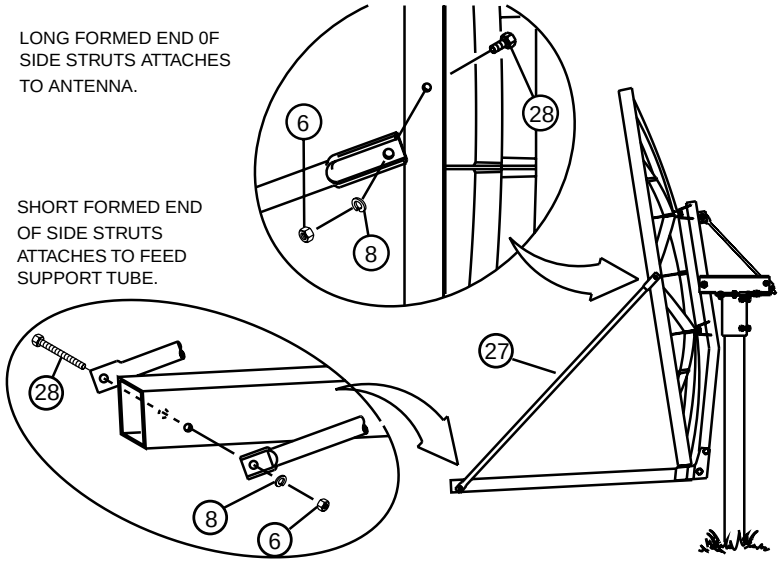


FIGURE 1.9A

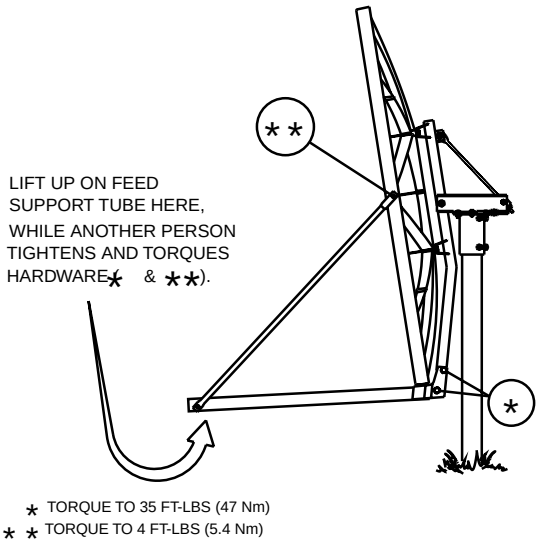


FIGURE 1.9B

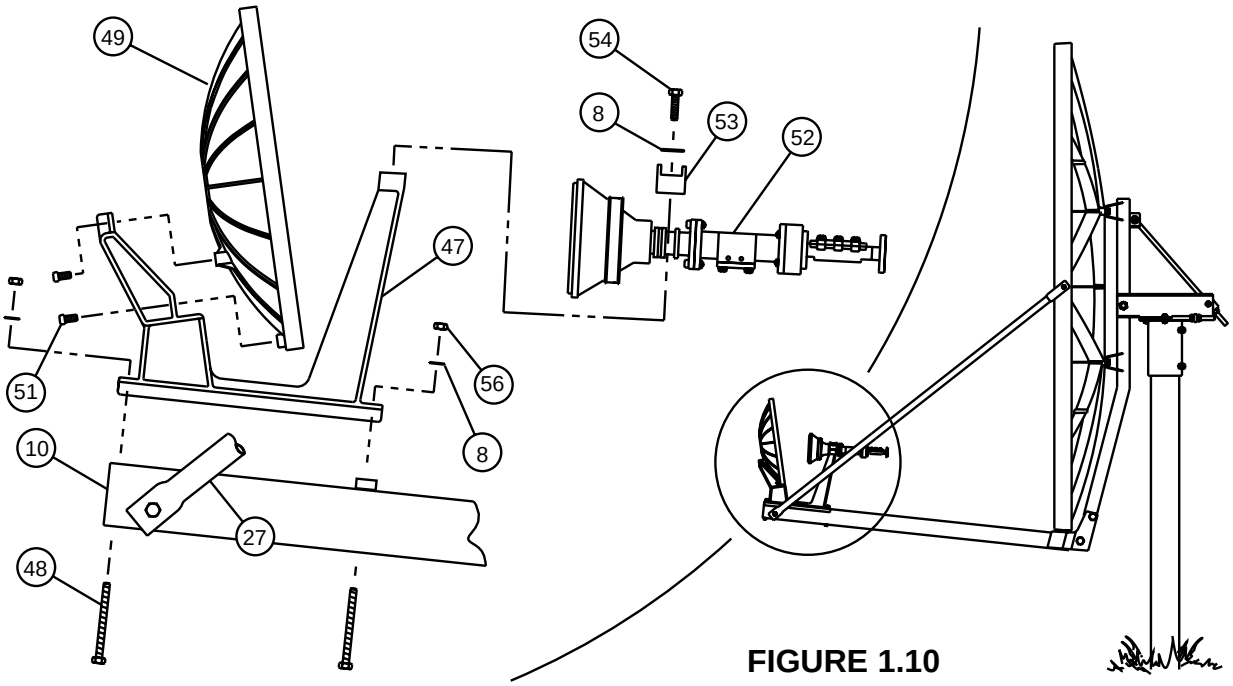


FIGURE 1.10

GROUNDING

TYPICAL ELECTRICAL GROUNDING FOR ANTENNA GROUND POLE

NOTE: All installations to conform to latest issue of National Electrical Code.

Ground antenna mount assembly and feed cables in accordance with current National Electrical code and local codes. Figures 2.0 and 2.1 illustrates typical grounding methods for the ground pole and feed cables.

Clamps that provide a solid connection between ground wire and ground source should be used.

Tighten and torque all hardware.

NOTE:
ALL INSTALLATIONS TO CONFORM TO THE LATEST ISSUE OF THE NATIONAL ELECTRIC CODE AND LOCAL CODES.

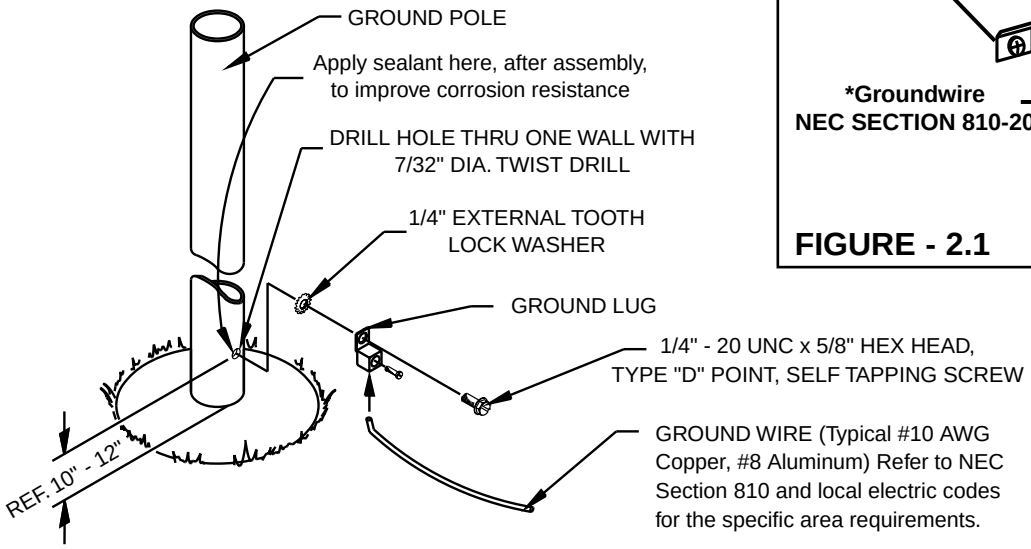


FIGURE - 2.0

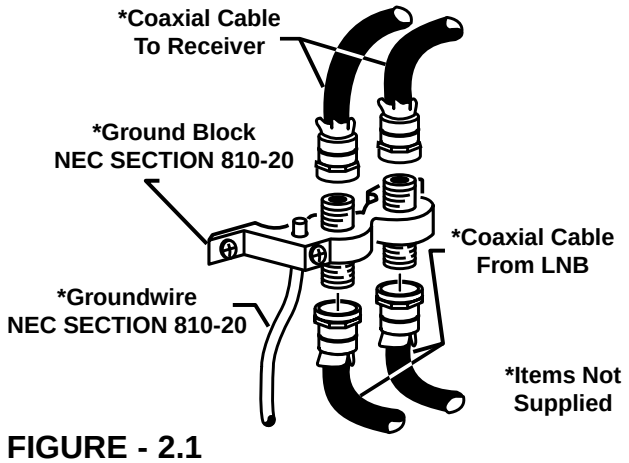


FIGURE - 2.1

ANTENNA ALIGNMENT PROCEDURE

Alignment with the satellite is obtained by setting polarization, elevation, and azimuth. Charts 1, 2 & 3 are to determine the values for your earth station antenna site. "ΔL" is the difference between the earth station antenna site longitude and the satellite longitude. Use "ΔL" and your earth station latitude to obtain polarization, elevation or azimuth setting.

Polarization of Feed

Loosen feed horn clamp bolts and turn feed clockwise or counterclockwise, depending on being east or west of the satellite as shown in Chart 1. Align marks on the horn clamp and appropriate mark on the horn scale. Polarization chart assumes antenna system polarization is Tx vertical and satellite vertical Pol is perpendicular to plane of geostationary arc. For horizontal Tx of antenna, feed must be rotated 90˚ from values shown. (Starting point for polarization adjustment is 0˚, as shown in Figure 3.0).

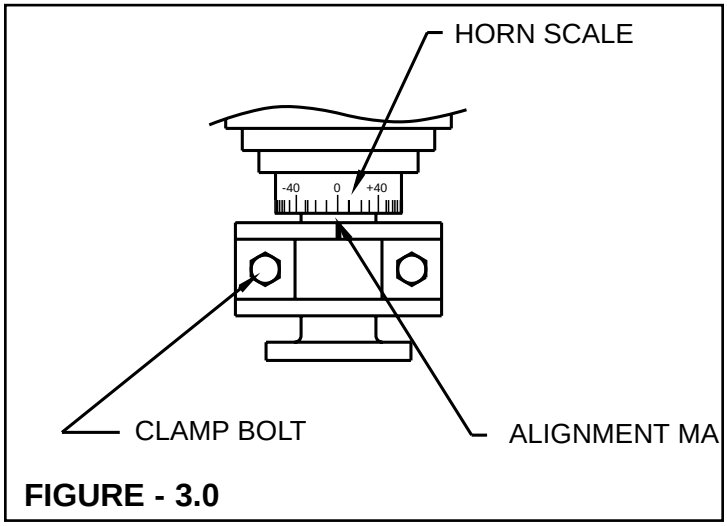


FIGURE - 3.0

Elevation Alignment

Use Chart 2 and determine your elevation setting. Using a clinometer, adjust the elevation by turning the elevation screw adjusting nuts until the desired elevation is obtained. Reference Figure 3.1. **Note: Degree values shown on the clinometer are mechanical; that is when the reflector face is vertical mechanical elevation is 90˚ or axis is 0˚, while the beam elevation (signal) axis is 22.62˚. Therefore as the reflector is tilted, remember to compensate for the 22.62˚ offset angle to get the correct beam elevation. (See Appendix A, Outline Drawing, Page 15).** This is an approximate setting. Optimum setting will be achieved during the fine tuning.

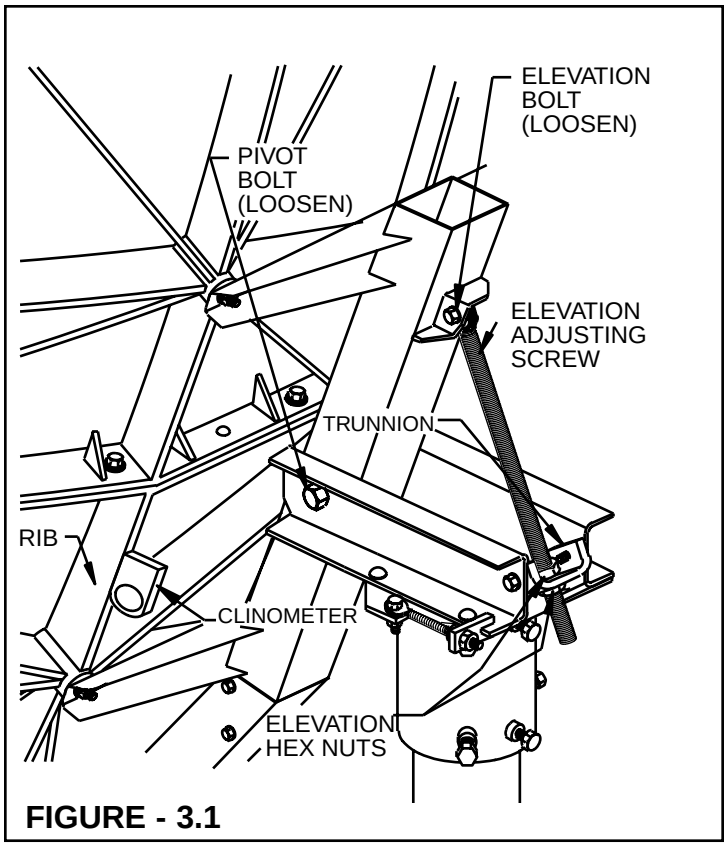


FIGURE - 3.1

Azimuth

Use Chart 3 and determine your azimuth setting. Values in chart must be adjusted for magnetic deviation for your location for correct compass reading.

Equally tighten the six azimuth locking bolts until snug. This will allow the reflector to rotate with slight resistance (Ref. Fig. 3.2).

Rotate reflector and mount, pointing to the compass reading for your location (Ref. Fig. 3.3).

Slowly sweep the reflector in azimuth until signal is found. If desired signal is not found, increase or decrease elevation setting and repeat the azimuth sweep. Tighten locking bolts.

Fine Tuning

Progressively tighten and torque azimuth locking bolts to 75-85 Ft-lbs (100-115 N-m). The four top plate locking bolts are pre-torqued to 8-11 ft-lbs. (11-15 N-m), maintain this torque until after azimuth is fined tuned.

Use a signal strength measuring device for final adjustments to obtain maximum antenna performance. Alternate between elevation and azimuth fine tuning to reach maximum signal strength, until no improvement can be detected. Gradually tighten (1/8 turn increments max.) top plate bolts in sequence 1, 3, 4 and 2 to 75 Ft-lbs. (100 N-m), refer to Figure 3.2. Observe for maximum signal strength as elevation screw's M22 locking nuts are tighten.

Polarization tune may be checked by carefully and slowly rotating feed assembly in clamp. When maximum signal strength is found, gradually tighten clamp bolts (Fig. 3.0). If a signal on the opposite polarity is available, this signal should be minimized.

Tighten and torque all hardware. Refer to Torque Chart on Page 2.

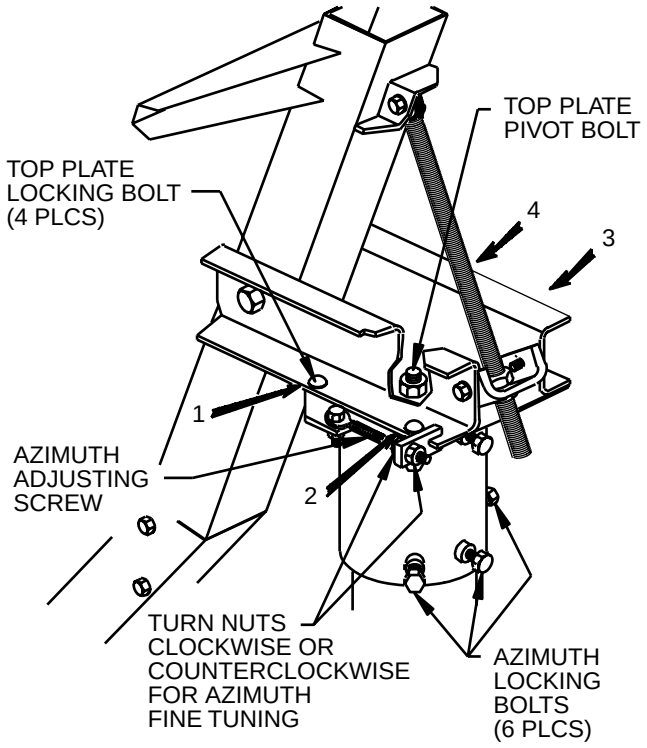
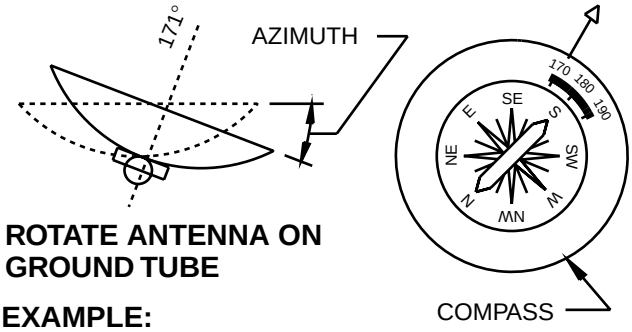


FIGURE - 3.2



EXAMPLE:
AZIMUTH HEADING T0 171˚
(Azimuth ± Magnetic Deviation)

FIGURE - 3.3

POLARIZATION CHART

"△ L" IS THE DIFFERENCE BETWEEN THE EARTH STATION ANTENNA SITE LONGITUDE AND THE SATELLITE LONGITUDE

POLARIZATION CHART SIGN VALUES (+ OR -)	NORTHERN HEMISPHERE	SOUTHERN HEMISPHERE
ANTENNA SITE WEST OF SATELLITE LONGITUDE	-	+
ANTENNA SITE EAST OF SATELLITE LONGITUDE	+	-

Feed Rotation (Facing Antenna)

For + Polarization, Rotate CCW (Counter Clockwise)
For - Polarization, Rotate CW (Clockwise)

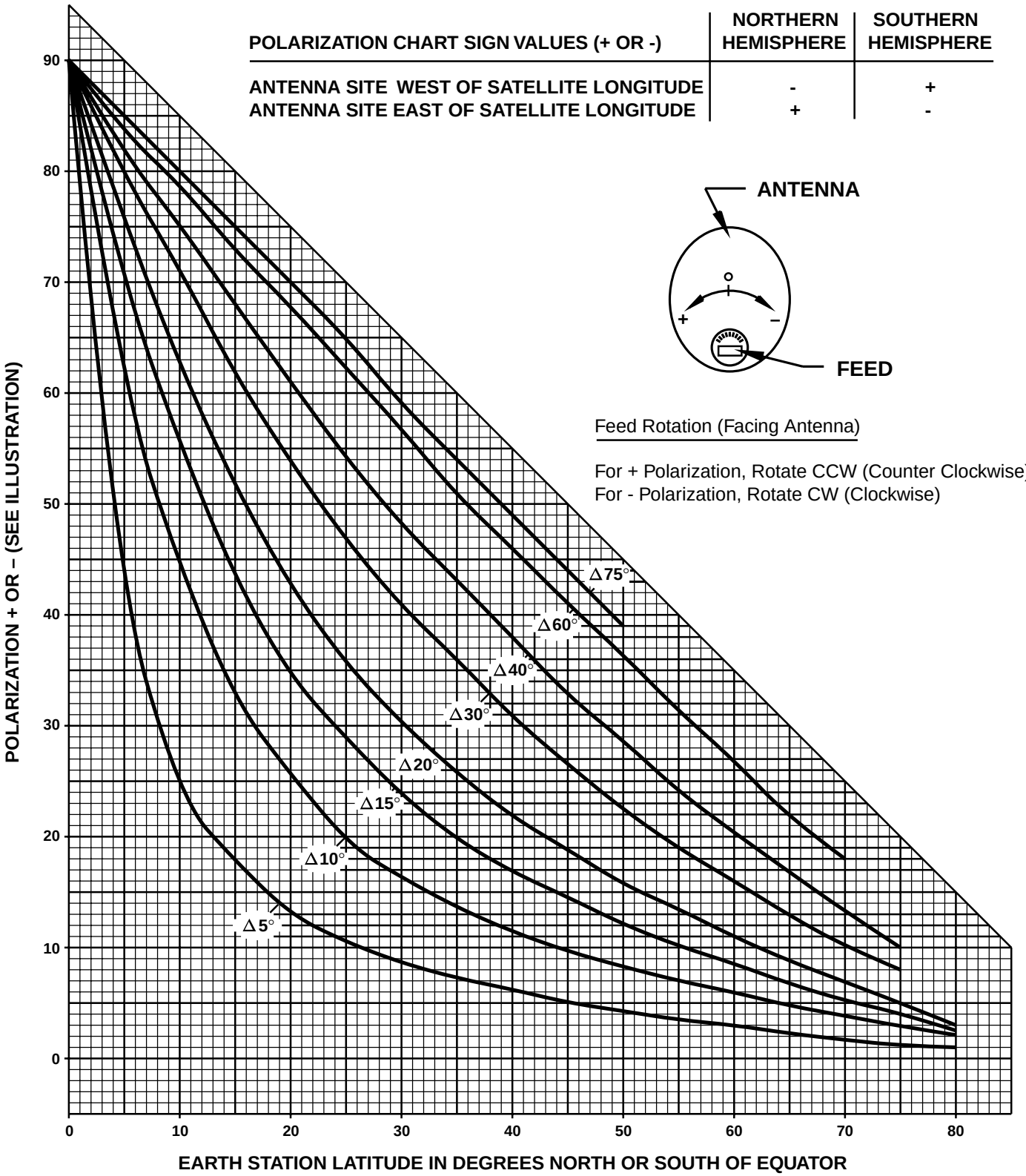


CHART 1

ELEVATION CHART

"Δ L" IS THE DIFFERENCE BETWEEN THE EARTH STATION ANTENNA SITE LONGITUDE AND THE SATELLITE LONGITUDE

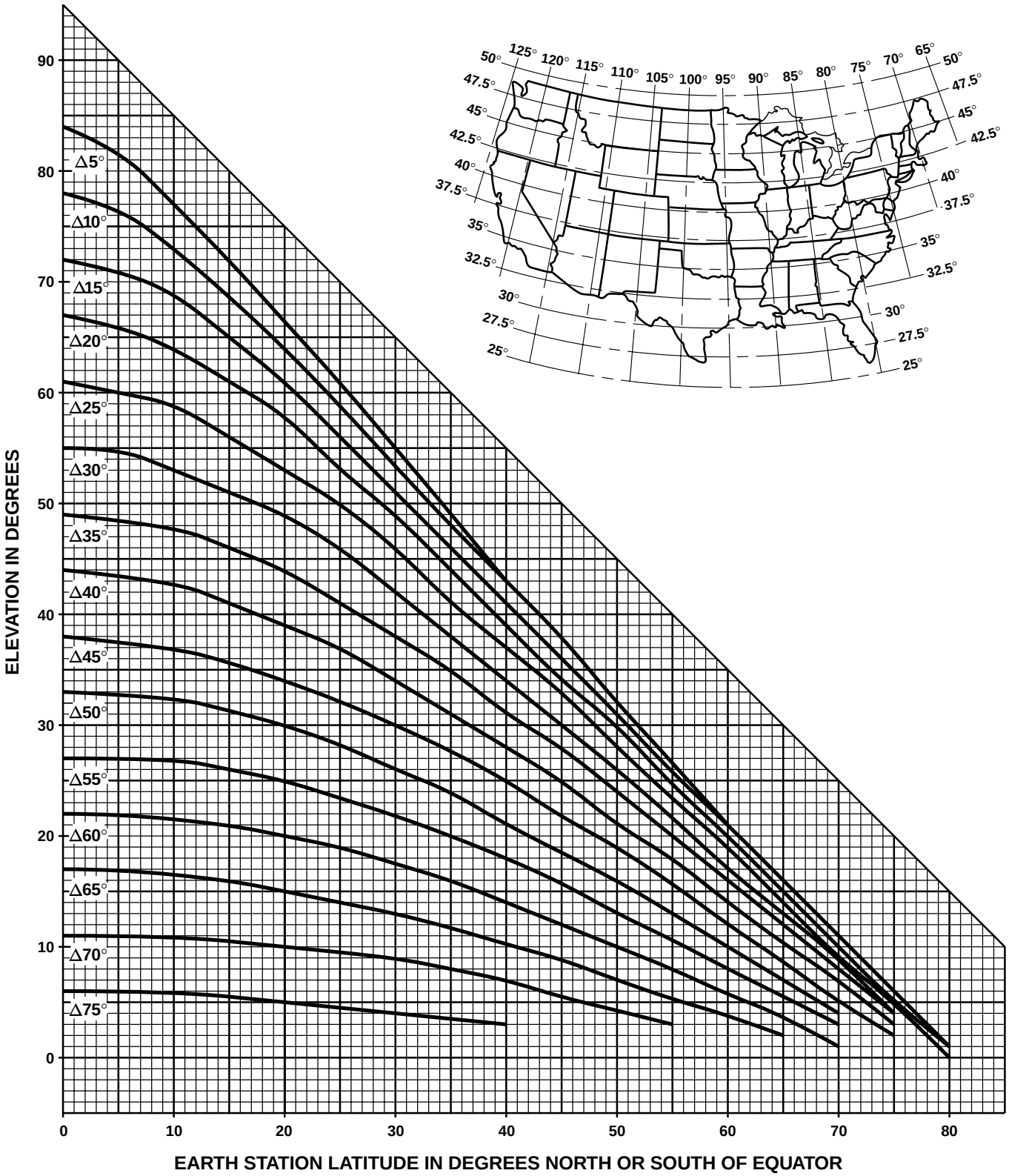


CHART 2

AZIMUTH CHART

"Δ L" IS THE DIFFERENCE BETWEEN THE EARTH STATION ANTENNA SITE LONGITUDE AND THE SATELLITE LONGITUDE

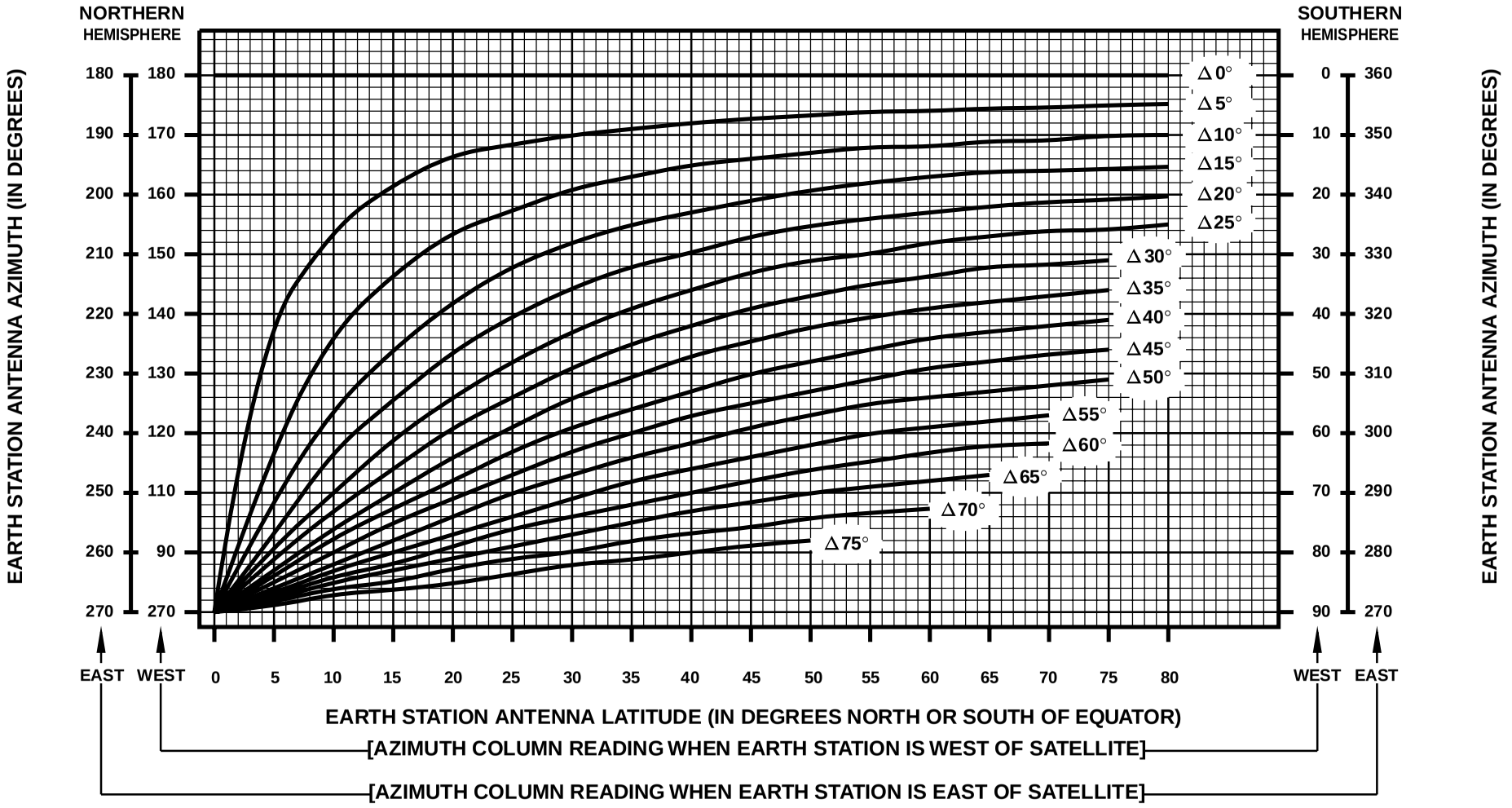
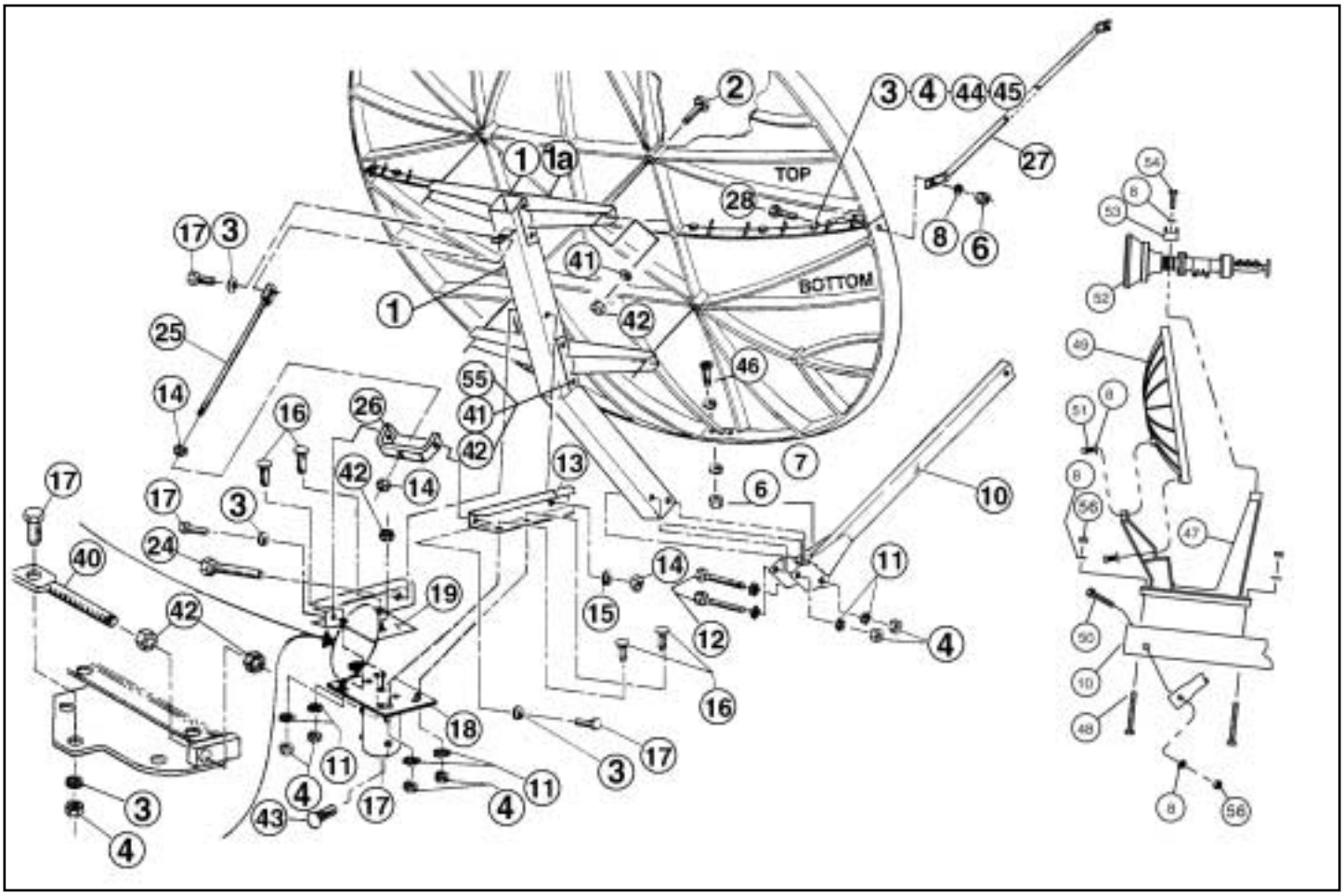


CHART 3

PARTS LIST



NO.	DESCRIPTION	QTY.
1	BACKFRAME TUBE WELDMENT, GALV.	1
1a	CROSS ARM WELDMENT	2
2	RD HD SQ NK BLT GALV M16 x 140mm	4
3	LOCK WASHER, GALV. M12	20
4	HEX NUT, GALV. M12	19
5	2.4M SMC ANTENNA TOP HALF (Tx QUALITY)	1
-	2.4M SMC ANTENNA BTM HALF (Tx QUALITY)	1
6	HEX NUT, SS M6	6
7	FLAT WASHER, SS M6	2
8	LOCK WASHER, SS M6-¼	4
10	BOTTOM FEED SUPPORT TUBE	1
11	EXTERNAL TOOTH LOCK WASHER, M12	4
12	HEX BOLT, GALV., M12 x 130mm	2
13	R.H. CHANNEL, CAP MT., GALV.	1
14	HEX NUT, GALV., M22	3
15	LOCK WASHER, M22	1
16	RD HD SQ NK BLT GALV., M12 x 35mm	1
17	HEX BOLT, GALV., M12 x 30mm	10
18	YOKE CAP ASSEMBLY, GALV.	1
19	TOP PLATE YOKE ASSY., GALV.	1
24	HEX BOLT, M22 x 150mm	1
25	ELEVATION ADJUSTMENT SCREW, M22	1

NO.	DESCRIPTION	QTY.
26	TRUNNION, GALV.	1
27	SIDE STRUT	2
28	HEX BOLT, SS, M6 x 20mm	4
40	AZIMUTH ADJUSTMENT SCREW	1
41	LOCK WASHER, GALV., M16	4
42	HEX NUT, GALV., M16	1
43	RD HD SQ NK BLT GALV., M16 x 35mm	1
44	HEX BOLT, GALV., M12 x 40mm	12
45	FLAT WASHER, M12	24
46	HEX BOLT, SS., M6 x 40mm, FULL THREAD	1
47	MT., SUB REFLECTOR	1
48	BOLT, HEX HD, ¼-20 x 3½ SS	2
49	SUB REFLECTOR	1
50	BOLT, HEX HD, SS, ¼-20 x 2	1
51	BOLT, HEX HD, SS ¼-20 x ½	4
52	HORN/OMT/FILTER ASSY	1
53	CLAMP, TOP	1
54	BOLT, HEX HD, SS ¼-20 x 1	1
55	BOLT, HEX HD, M16 x 130mm, GALV.	4
56	HEX NUT ¼-20	3

MAINTENANCE

To ensure that the Tx/Rx Mount and 1.8m SMC Offset Antenna is operating efficiently and at an optimum, moderate maintenance is required. We recommend conducting as routine Maintenance Inspection every six months or as needed if unusual circumstances occur, such as severe weather conditions, falling objects and vandalism. The following checklist is provided for your convenience.

MAINTENANCE INSPECTION CHECKLIST:

1 - FOUNDATION

- Structural Damage

2 - Tx/Rx MOUNT

- All bolts (if any loosening has occurred tighten and torque - refer to Torque Chart Page 2)
- Structural Damage
- Corrosion of galvanized steel members (if necessary, repair with cold zinc-rich galvanizing paint)

3 - 1.8m SMC OFFSET ANTENNA

- Bolts - M12 round head square neck, securing antenna to mount (Correct torque 20 Ft-lbs/27N-m)
- Structural Damage

4 - BOTTOM FEED SUPPORT TUBE, SIDE FEED SUPPORT STRUTS AND ORU BRACKET

- All bolts (if loosening has occurred tighten and torque - refer to Torque Chart on Page 2).
- Structural Damage
- Corrosion of galvanized steel members (if necessary, repair with cold zinc-rich galvanizing paint)

5 - FEED ASSEMBLY

- All securing hardware
- Structural Damage
- Feed Horn Weather Cover - Physical Damage (if damaged, replace to prevent entry of water)

Upon inspection, make necessary repairs and replace any damaged parts.

For replacement parts, contact:

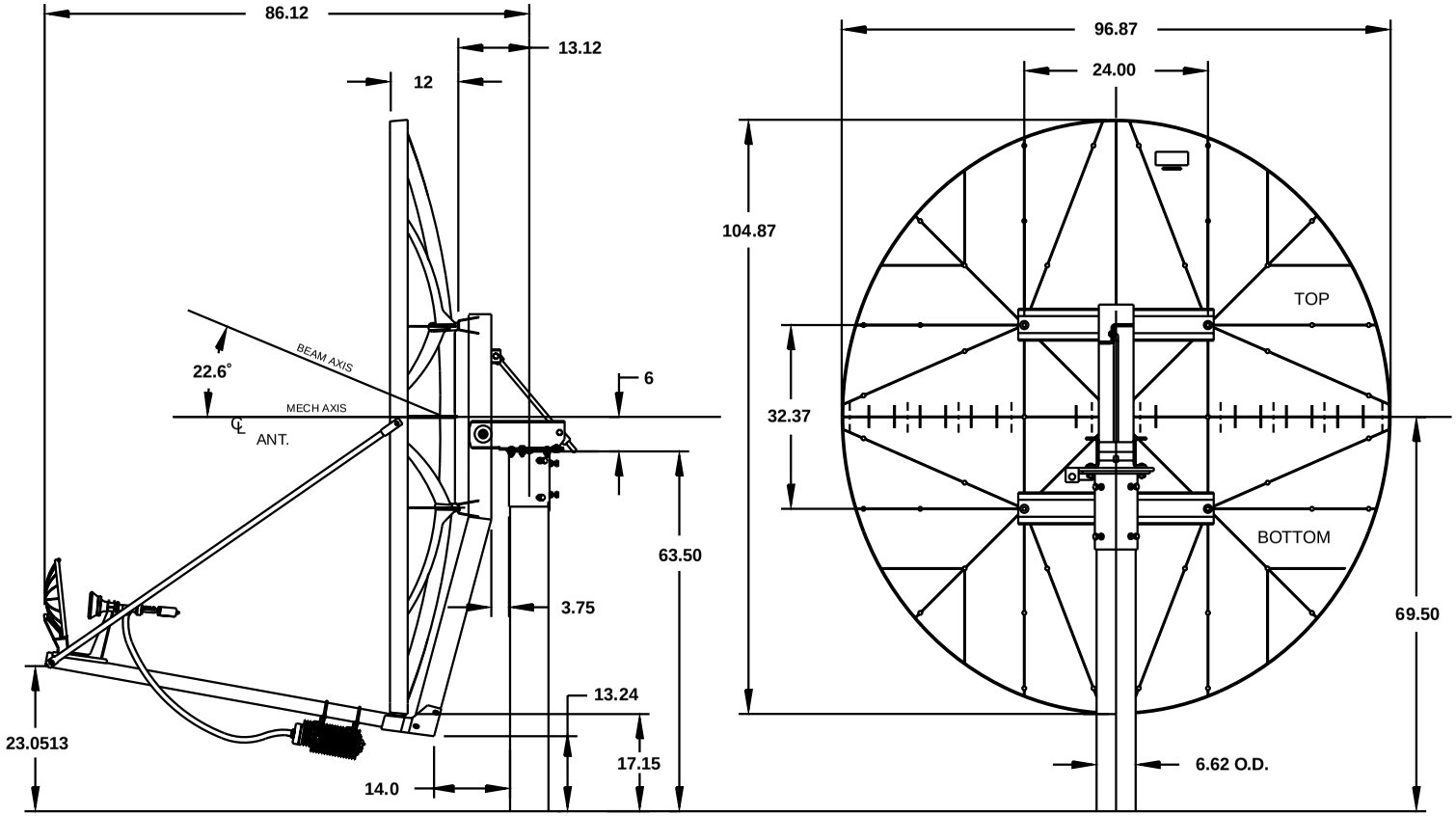
U.S.A. VSAT Customer Service
CHANNEL MASTER
1315 Industrial Park Drive
Smithfield, NC 27577
(919) 989-2205 ■ Fax (919) 989-2200

APPENDIX A

OUTLINE DRAWING

TYPE 243 2.4m OFFSET SMC REFLECTOR W/Tx/Rx MOUNT

ALL DIMENSIONS IN INCHES



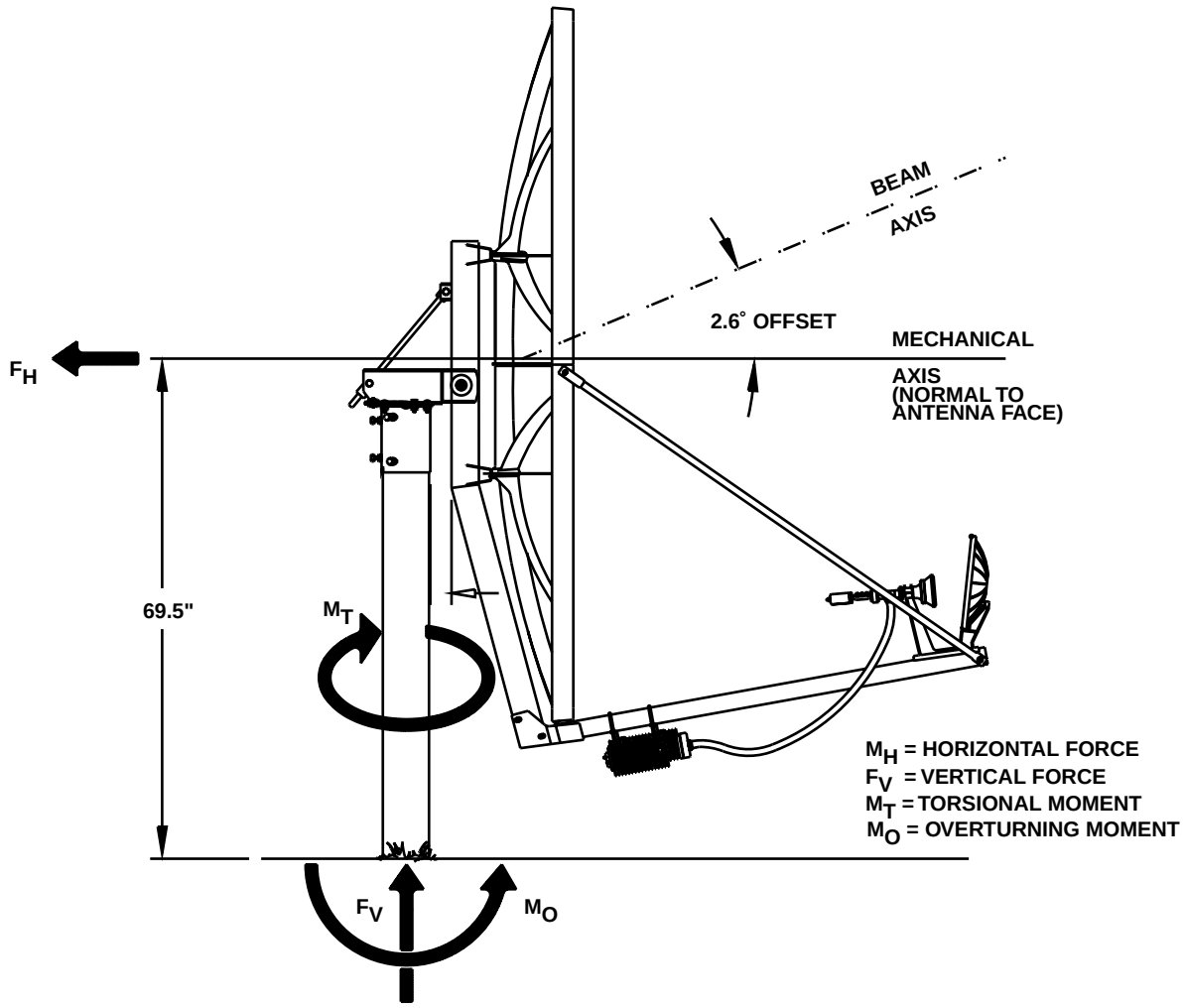
6" GROUND PIPE	EXPOSURE	MAXIMUM DISTANCE FROM GROUND TO ℄ OF ANTENNA (NOTE: ℄ IS 6" ABOVE TOP OF GROUND POLE) FOR WIND SPEED OF: 125 MPH	120 MPH	115 MPH	110 MPH	100 MPH
6.62 O.D	B	96"	–	–	–	–
x 6.06 I.D.	C	62"	67"	73"	80"	–
Schedule 40	D	–	–	–	61"	73"
6.62 O.D.	C	89"	96"			
x 5.76 I.D.	D	67"	80"			
Schedule 80						

NOTES:

1. **Antenna and mount certified to withstand 125 mph wind.**

2. **Chart based on A36 (36,000 psi yield) steel and 1.5 stability - 1991 Uniform Building Code Table 23G Exposure B, C or D at 0-15' height above ground.**

APPENDIX B

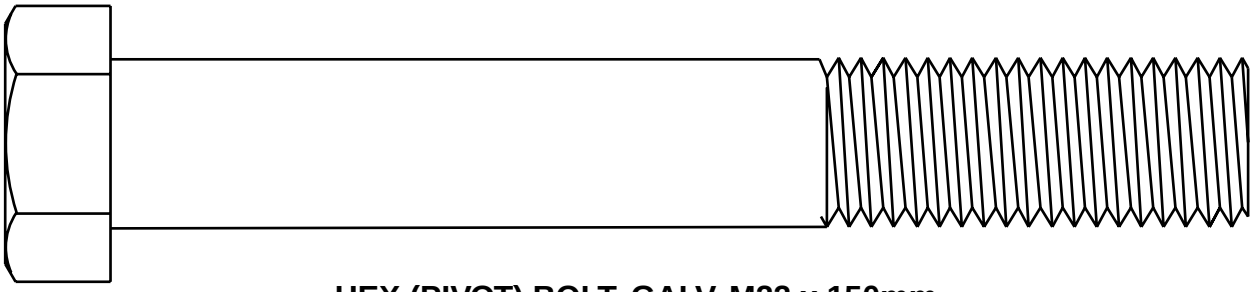


ELEVATION DEGREES		FORCE (POUNDS)		MOMENTS (FOOT-POUNDS)	
MECH.	BEAM	F_H	F_V	M_T	M_O
0	23	3,330	-89	2,612	19,286
10	33	3,152	-666	2,557	18,255
20	43	3,064	-1,288	2,426	17,746
30	53	2,775	-1,843	2,202	16,072
40	63	2,442	-2,220	1,867	14,143
50	73	2,131	-2,442	1,568	12,342
60	83	1,776	-2,553	1,213	10,286
70	93	1,332	-1,976	933	7,715

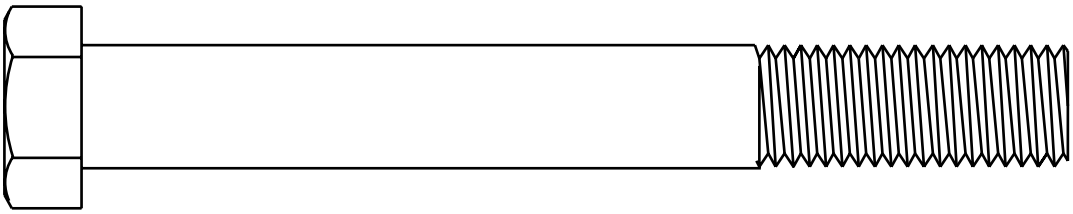
M_O BASED ON 69.5” (1.77m) FROM MOUNTING SURFACE TO $\mathcal{C}_L$ OF ANTENNA.

Values shown above represent maximum forces for any wind direction.
Height and exposure factors from the uniform building code are NOT included.

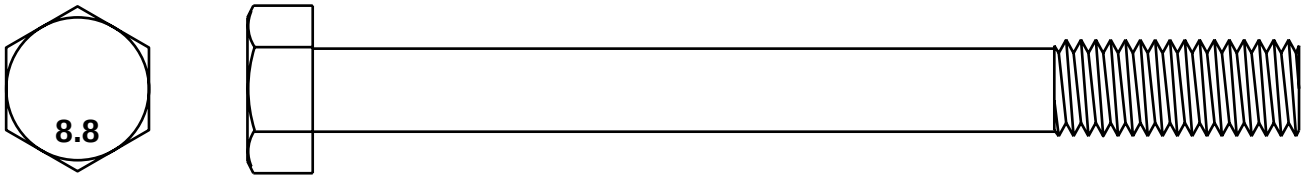
HARDWARE SORTER



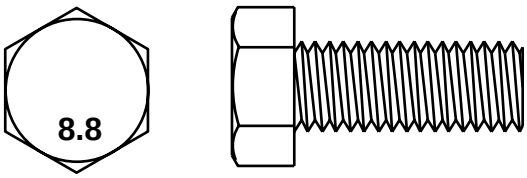
HEX (PIVOT) BOLT, GALV. M22 x 150mm
ITEM 24



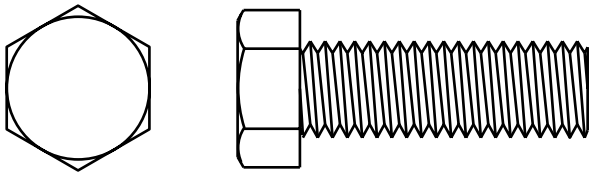
HEX HEAD BOLT, GALV. M16 x 130mm
ITEM 47



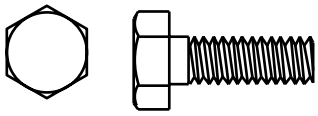
HEX HD BOLT, GALV. M12 x 130mm CLASS 8.8
ITEM 12



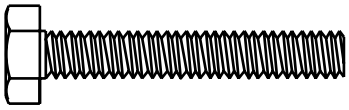
HEX HD BOLT, GALV.
M12 x 30mm CLASS 8.8
ITEM 17



HEX HD BOLT, GALV. M12 x 40mm
ITEM 44



HEX HD CAP SCREW, SS
M6 X 20mm
ITEM 28

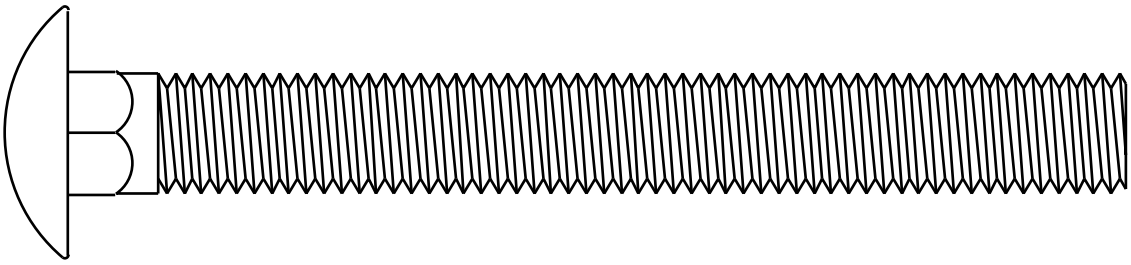


HEX HD CAP SCREW, SS
M6 X 40mm
ITEM 15

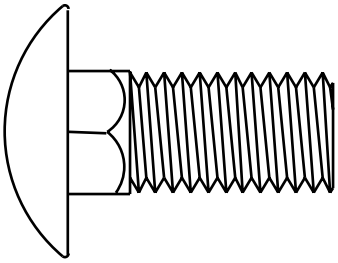
Hardware illustrations are true size. Place actual hardware on top of illustration to identify.

more hardware ⟶

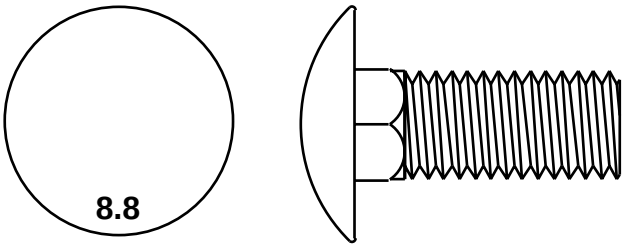
HARDWARE SORTER



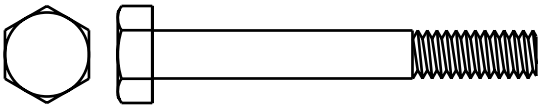
ROUND HD SQ NK BOLT, GALV. M16 x 140mm
ITEM 2



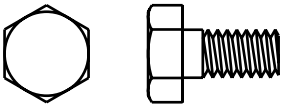
ROUND HD SQ NK BOLT, GALV.
M16 x 35mm
ITEM 43



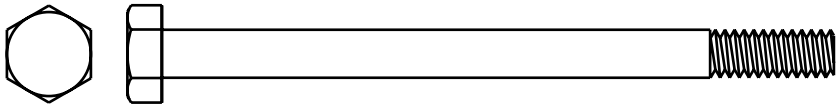
ROUND HD SQ NK BOLT, GALV.
M12 x 35mm
ITEM 16



HEX HD CAP SCEW, SS
1/4-20 UNC x 2"
ITEM 50



HEX HD CAP SCEW, SS
1/4-20 UNC x 1/2"
ITEM 51



HEX HD CAP SCEW, SS
1/4-20 UNC x 3 1/2"
ITEM 48

Hardware illustrations are true size. Place actual hardware on top of illustration to identify.